



BRAYOPHYLLUM PINNATUM – PROMISING HERB FOR URINARY STONES WITH BLACK PEPPER POWDER”: A REVIEW

Mrs. Priyanka A. Gaikwad*, Mr. Pranil B. Toraskar, Miss. Supriya S. Kore and Dr. Sachin S. Mali

Y.D.Mane Institute of Pharmacy, Kagal 416 216, Maharashtra, India.

*Corresponding Author: Mrs. Priyanka A. Gaikwad

Y.D. Mane Institute of Pharmacy, Kagal 416 216, Maharashtra, India.

Article Received on 11/07/2022

Article Revised on 31/07/2022

Article Accepted on 20/08/2022

ABSTRACT

We are all affected by the pandemic crisis. In everyday life, herbal medicine refers to the use of any plant to treat illness. *Brayophyllum pinnatum*, a species of the Crassulaceae family, can be found in gardens throughout tropical Africa, India, tropical America, China, and Australia. This herb has a long history to treat urinary calculi. Urolithiasis, also known as renal or urinary calculi, is a disorder characterised by the production and retentment of the stone(s) in the kidney, bladder, and/or urethra. Furthermore, the leaves of this plant have an important component of poly-herbal preparations and mostly used for antilithiatic activity. Plants also have a wide range of medicinal applications. The leaves of the plant are generally treated kidney and bladder stones, as well as urinary inadequacy.

KEYWORDS: *Brayophyllum Pinnatum*, Miracle plant, Antilithiatic drug, Black pepper.

INTRODUCTION

Surgical removal of stone and lithotripsy are the new options to manage and treat the kidney stone disorders. But they are expensive, also do not prevent the recurrence of stone formation.^[3,4] As a result, there is a growing interest in using medicinal herbs to treat stone problems and disorders. For the treatment of urinary stones and kidney disorders, the Ayurvedic school of medicine suggests the use of numerous medicinal plants and their formulations.^[5,6]

Medicinal herbs are widely utilised around the world to treat many diseases. According to WHO medicinal plants are a wonderful source of a varied range of potential therapeutic pharmaceuticals, and these compounds are relatively safe and cost effective when compared to synthetic medicines.^[1] Researchers have been more focused on herbal medications in recent years, and various plants are being studied for potent pharmacological properties. Currently *Bryophyllum Pinnatum*, which is widely employed in folk therapies, based on the therapeutic efficacy of medicinal plants. In India, the plant *Brayophyllum pinnatum* (*B.pinnata*) is utilised in traditional medicine. The *Brayophyllum pinnatum* are also known as air plant, cathedral bells, life plant, miracle leaf, and gothe plant. It has become a popular houseplant after becoming naturalised in tropical and subtropical countries. The most common application of these leaves is in the treatment of urolithiasis. Urolithiasis, also known as renal or urinary calculi, is a disorder characterised by the production and retentment

of stone(s) in the kidney, bladder and/or urethra that results in renal colic, urine retention and pain in the abdomen and flank.^[2] The kidney stone occurs 12% of world population and 50% of recurrence rate in 5-10 years of treatment.^[6] Kidney stones and urinary disorders are most painful conditions and have been affected people for several centuries. These stones can last an extensive period of time, generating subsequent issues that can have severe results for the patient's life. It is intensely painful, and proper treatment is required to resolve the problems. Outside of India, other countries are used to cure infections, gastrointestinal problems, and wound healing. Its anticancer activities, however, are unknown. We designed a study to evaluate the anti-cancer and anti-Human Papillomavirus (HPV) properties of *B. pinnata* leaf extracts and to identify the active principle.^[7,8]

Pathophysiology of urinary stone

Stone formation

Highly concentrated urine constituents crystallize and harden to form calculi. When our urine contains more crystal-forming substances, such as calcium, oxalate, and uric acid, kidney stones form. Simultaneously, our urine may be lacking in substances that prevent crystals from sticking together, creating an ideal environment for kidney stones to form. The crystals grow and are deposited on the nucleus. These can occasionally tend to stick to the renal papillae.

Kidney stones result from the growth of crystals into stones. Crystals form in urine that is supersaturated with particular salts such as calcium oxalate, sodium urate, magnesium ammonium phosphate, or cystine. There is a maximum to the amount of a compound that can be kept in stable solution, which is defined by its solubility or equilibrium concentration product. Supersaturation results when the amount of a compound in solution exceeds the solubility; at that point, there is a process that begins to remove this excess by crystal formation. This can be manipulated in two ways: by changing the amount or concentration of compound available for crystallisation, or by changing the compound's solubility.

One example of the former is lowering the amount of calcium or cystine in a patient's urine who has hypercalcaemic or cystinuric stone disease, or lowering the concentration of calcium or cystine through increased fluid intake (dilution of the urine). In patients with uric acid or cystine stone disease, increasing the urinary pH or increasing the urinary excretion of naturally occurring inhibitors of crystal formation, such as citrate, are examples of the latter. Any factor that reduces urinary flow or causes obstruction, which results in urinary stasis or reduces urine volume through dehydration and inadequate fluid intake, increases the risk of developing kidney stones. Low urinary flow is the most common abnormality, and most important factor to correct with kidney stones. It is important for health practitioners to concentrate on interventions for correcting low urinary volume in an effort to prevent recurrent stone disease.

Types of stone

- Calcium Stones
- Calcium Oxalate (60%)
- Calcium Phosphate (10%)
- Calcium Oxalate and Calcium Phosphate(10%)
- Struvite Stones (10-15%)
- Uric Acid Stones (5-10%)
- CystineStones (1-2%)

Diagnostic Studies

- **Blood testing:** Blood tests may reveal too much calcium or uric acid in your blood. Blood test results help your doctor monitor the health of your kidneys and may prompt him or her to look for other medical conditions.
- **Urine testing:** The 24 hour urine collection test may reveal that you are excreting either too many stone forming minerals or not enough stone-preventing substance. Your doctor may request that you collect two urine samples on two consecutive days for this test.
- **Imaging:** Urinary tract imaging tests may reveal kidney stones. Simple abdominal X-rays, which can miss small kidney stones, can be replaced with high-speed or dual energy computerised tomography (CT), which can detect even small stones.

Other imaging options include an ultrasound is a noninvasive test, and intravenous urography involves injecting dye into an arm vein and taking X-rays (intravenous pyelogram) or CT images (CT urogram) as the dye travels through your kidneys and bladder.

- **Analysis of passed stones:** You might be asked to urinate through a strainer to catch any stones that pass through. The composition of your kidney stones will be revealed through laboratory analysis. This information is used by your doctor to determine what is causing your kidney stones and to devise a plan to prevent future kidney stones.

Management

Lifestyle Change
Dietary modification
High fluid intake
Reduced protein intake
Limiting sodium intake
Calcium intake
Allopathic treatment
Herbal treatment

Treatment & Prevention

- ❖ **Acute treatment**
- ❖ Pain Medication!!
- ❖ Strain urine for stones
- ❖ Keep Hydrated
- ❖ Ambulation
- ❖ Diet Restrictions
- ❖ Emotional Support
- ❖ Invasive Procedure (may be necessary)

Surgical procedures

- Lithotripsy:** It is a technique that uses sound waves to break up large stones into smaller fragments that can pass through the urinary tract.
- Extracorporeal Shock-Wave Lithotripsy (ESWL)
- Percutaneous Ultrasonic
- Electrohydraulic
- Laser
- Surgical therapy**
- Nephrolithotomy (Kidney)
- Pyelolithotomy (Renal Pelvis)
- Ureterolithotomy (Ureter)
- Basket Extraction/Ureteroscopy**

Prevention

- **Hydration**
- Drink 3 liters of fluid per day (14 cups)
- Ideally water
- Lemonade (citrate decrease stone formation)
- **Diet**
- Low sodium & calcium intake.
- Avoid intake of oxalate-containing foods (eg, spinach, strawberries, rhubarb, tea, peanuts, wheat bran).
- Low protein intake is required.
- **Exercise/Increase Activity**

Avoid activities leading to sudden increases in environmental temperatures that may cause excessive sweating and dehydration.

Allopathic treatment

Names of drugs used in treatment of kidney stones

Allopurinol

Allopurinol is a xanthine oxidase inhibitor, prescribed for gout. It is used to treat high uric acid levels in the blood or urine caused by certain types of cancer chemotherapy.

Trade names

Allgout (100mg) | Allopurinol (100mg) | Lodiric (100mg) | Aloric (100mg) | Myloric (100mg) | Dynol (100mg) | Algor (100mg) | Kayloric (100mg) | Allgoric (100mg) | Estinol (100mg)

Potassium Citrate

Potassium Citrate is an urinary alkalinizing agent, prescribed for kidney stones.

Trade names

Lasertrate (1100mg/375mg) | Ston-1 (1100mg/375mg/5mL) | Ston-1 B6 (714.9mg/263.1mg/15mg) | Ston-1B6 (1100mg/375mg/20mg) | Ston-1B6 (1100mg/375mg/20mg) | BIO-D3 DS

Tamsulosin

Tamsulosin is an alpha blocker, prescribed for benign prostatic hyperplasia (BPH) or prostate enlargement. It improves the flow of urine by relaxing the muscles of the prostate and the lower part of the bladder.

Trade names

Veltam (0.2mg) | Prostulin (0.2mg) | Flodart | Urimax 0.4 | Gotam | Uritin | Prostulin (0.4mg) | Veltam (0.4mg) | Tamsin | Ubimax (0.4mg)

Tioprozin

Is a chelating agent that is used to prevent kidney stone formation.

❑ Disadvantages of using surgical treatments

When the kidney stone is large enough and becomes almost impossible to treat by natural treatment, surgery remains as the option to save the life of the patient. But these surgical treatments may develop many other complications during and after the surgery is successful. For example, anesthesia is necessary which may not be suitable in elderly patients. Secondly, treatment with SWL (Shock Wave Lithotripsy) may cause kidney injury after the surgery. In some cases, this can lead to high blood pressure and diabetes.

Herbal treatments

Number of herbal medicines are available for treatment of kidney stone but *Bryophyllum pinnatum* with black pepper powder is the miracle effect. We studied

pharmacognostic view of *Bryophyllum pinnatum* plant and black pepper

Introduction to *Bryophyllum pinnatum*

Synonym: *Bryophyllum calycinum* Salisb

Cotyledon pinnata Lam

Crassula pinnata

Kalanchoe pinnata

Sedum madagascariense

Botanical name: *Bryophyllum pinnatum*

Common name: Couelus, miracle leaf

Family: Crassulaceae

Geographical distribution: This can be found in the Himalayas, Kashmir, and the Assam khasi hills. The plant is now grown on a large scale in Andhra Pradesh, Karnataka, Tamil Nadu, and Kerala and sold to pharmaceutical companies. It grows well on the dry hill slopes. It can also be found in the Indian plains.

Organoleptics characteristics

Colour: Dark green, green

Test: Sour, sweet in post digestive effect

Texture: Plant that grows 1-1.5 m in high stem is hollow four angled and usually branched. Leaves are opposite, decussate, succulent. The lower leaves are simple, they are fleshy dark green that are distinctively scalloped and trimmed in red.

Dimension: Plant that grows 1-1.5m in height

Leaves: 10-20cm long. The upper ones 3-7 foliate and are long petioled.



Introduction to black pepper:

Synonym: *Piper nigrum*

Botanical name: *Piper*

Common name: Kali miri

Family: Piperaceae

Geographical distribution:

Black pepper is indigenous to Kerala's Western Ghats, where it grows wild in the mountains. As a commercial crop, it is grown throughout the tropics. The major producers are Vietnam, Indonesia, Brazil, and India.



Organoleptic characteristics:

Colour: Brownish black

Odour: Pungent

Taste: Spicy, worm

Dimensions: The fruit is when fresh and fully mature, is about 5 mm (0.20 in) in diameter, dark red, and contains a stone which encloses a single pepper seed.

Combination of chemical constituents of *Brayophyllum pinnatum* and black pepper:^[10]

The plant has a variety of chemical constituents, but the most important are bufadienolides and flavonoids. Bryophyllin B and A, which are significant bufadienolides, have been isolated from leaves. The flavonoids quercitrin, kapinatoside, 8 methoxyquercetin-3,7-di-Orhamnopyranoside, and 3',4'-dimethoxy quercetin were isolated. Afzelin and -rhamnoisorobin are two other flavonoid compounds. Alkaloids, saponins, glycosides, and tannins have all been discovered in the plant. Alkanes, triterpins, and steroids such as - amyryn, - amyryn, and sitosterol are also found in the plant's leaves. *Bryophyllum pinnatum* leaves are rich in bioactive compounds like terpenoids, alkaloids, flavonoids, phenols and saponins.

There are numerous chemical constituents in black pepper. Piperine, one of the key chemical ingredients, is a diuretic and anti-inflammatory that aids the body in eliminating undesired toxins. Piper nigrum phenolic amides, seven Piper retrofractum compounds, and two Piper baccatum compounds All phenolic amides have significant antioxidant activities that outperform the naturally occurring antioxidant alpha-tocopherol. Feruperine, one of the amides, has antioxidant activity comparable to the synthetic antioxidants butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT). Piper nigrum phenolic amides, seven Piper retrofractum compounds, and two Piper baccatum compounds All phenolic amides have significant antioxidant activities that outperform the naturally occurring antioxidant alpha-tocopherol. Feruperine, one of the amides, has antioxidant activity comparable to the synthetic antioxidants butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT)^[8]

Uses of *B. pinnatum* and black pepper.^[9,10,11]

The traditional medicinal uses and ethnomedical practice in India *B. pinnatum* leaf is the part of the plant mostly used by the population, whereas the juice is the most frequent mode of preparation those have been used to treat:

- (i) Skin problems,
- (ii) Problems in the respiratory system,
- (iii) Urinary stone pain in stomach,
- (iv) Inflammation and
- (v) Disorders in the gastrointestinal system.

The inflammatory and gastric problems (ulcers and gastritis) are the most commonly treated disorders.

The black pepper powder is used as diuretic. Hence, it cures difficult urination. The leaf juice is used for the treatment of stomach ache.

Assumptions

While using *B. pinnatum* leaves with black pepper powder we enhance the diuretic activity when we use leaf extract for the treatment of kidney stone (urolithiasis). Treatment of insufficiency or disorder in urine formation we use this combination. But on this combination of chemical constituents no any research was done. No any exact proof of both together chemical constituents which enhance or produce diuretic activity. And used in treatment of urolithiasis.

REFERENCES

1. Sharma A, Shanker C, Tyagi LK, Singh M, Rao CV. Herbal medicine for market potential in India: An overview. *Acad J Plant Sci*, 2008; 1: 26-36.
2. Mahendra Yadav, Vijay D Gulkari, Manish M Wanjari *by Bryophyllum pinnatum* Leaf Extracts Prevent Formation of Renal Calculi in Lithiatic Rats, *Anc Sci Life*, 2016; 36(2): 90-97. doi: 10.4103/asl.ASL_90_16
3. Kamboj A, Saluja AK. *Bryophyllum pinnatum* (Lam.) Kurz.: Phytochemical and pharmacological profile: A review. *Pharmacogn Rev*, 2009; 3: 364-74. [Google Scholar]
4. Tombolini P, Ruoppolo M, Bellorofonte C, Zaatari C, Follini M. Lithotripsy in the treatment of urinary lithiasis. *J Nephrol*, 2000; 13(3): S71-82. [PubMed] [Google Scholar]
5. Kishimoto T, Yamamoto K, Sugimoto T, Yoshihara H, Maekawa M. Side effects of extracorporeal shock-wave exposure in patients treated by extracorporeal shock-wave lithotripsy for upper urinary tract stone. *Eur Urol*, 1986; 12: 308-13. [PubMed] [Google Scholar]
6. Mishra LC. *Scientific Basis for Ayurvedic Therapies*. Boca Raton, New York: CRC Press, 2004; 535-50. [Google Scholar]
7. Mitra SK, Gopumadhavan S, Venkataranganna MV, Sundaram R. Effect of cysteine: A herbal formulation, on glycolic acid-induced urolithiasis in rats. *Phytother Res*, 1998; 12: 372-4. [Google Scholar]

8. Parkin DM: The global health burden of infection-associated cancers in the year 2002. *Int J Cancer*, 2006; 118(12): 3030-3044.
9. Durst M, Gissmann L, Ikenberg H, zur Hausen H: A papillomavirus DNA from a cervical carcinoma and its prevalence in cancer biopsy samples from different geographic regions. *Proc Natl Acad Sci USA*, 1983; 80(12): 3812-3815.
10. Piperine potentiates the hypocholesterolemic effect of curcumin in rats fed on a high-fat diet. PUBMED <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4061201/>
11. Chemical constituents of peppers (*Piper* spp.) and application to food preservation: naturally occurring antioxidative compounds N Nakatani, R Inatani, H Ohta, and A Nishioka, 1986; 67: 135–142. Available from: <http://www.homeremediess.com> Medicinal plants and their uses
12. Amelioration of Obesity, Glucose Intolerance, and Oxidative Stress in High-Fat Diet and Low-Dose Streptozotocin-Induced Diabetic Rats by Combination Consisting of “Curcumin with Piperine and Quercetin”. PUBMED <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3317057/>